

CLAIMS

1. Apparatus for controlling the flow of fluid to or from a human or animal body, the apparatus including:-

a flow passage having an inlet and an outlet,

5                   respective spaced flow control means disposed between the inlet and the outlet for controlling the flow of liquid through the apparatus and defining between them at least one chamber region,

at least one sensing means for sensing one or more properties of the liquid in or adjacent the apparatus in use, and

10                  control means for controlling operation of the flow control means in response to at least one of:

(i) a sensed property of the liquid, and

(ii) elapse of a predetermined time interval.

2. Apparatus according to claim 1 wherein said flow passage is defined by a tube of resilient material, between the inlet end and outlet end of which are disposed the first and second flow control means.

3. Apparatus according to claim 1 or claim 2 wherein the tube of resilient material includes a generally smooth and continuous inner surface.

4. Apparatus according to claim 2 or Claim 3 wherein each of the flow control means comprises an actuator for resiliently deforming the local wall region of the tube to press opposite regions towards each other thereby to wholly or partially close the tube thereby to prevent or reduce as the case may be, the flow of liquid through said tube.

5. Apparatus according to any of the preceding claims wherein said flow passage is located in the flow path between a catheter and a drainage tube or bag.

6. Apparatus according to Claim 4, wherein said tube of resilient material is  
5 a disposable item which is removably located in a housing, which supports said actuators.

7. Apparatus according to Claim 6, wherein at least one of said sensing means is also located in said housing.

8. Apparatus according to any of the preceding claims, wherein said sensing  
10 means includes a pressure sensor.

9. Apparatus accord to any of the preceding claims when said sensing means includes a pH sensor.

10. Apparatus according to Claim 9, wherein said pH sensor comprises a pH probe exposed to the fluid in use in said flow passage.

15 11. Apparatus according to Claim 10, wherein said pH probe is an ion sensitive field effect transistor (ISFET) probe.

12. Apparatus according to any of the preceding claims wherein said sensor means include a flow rate sensor.

13. Apparatus according to Claim 12, wherein said flow rate sensor  
20 comprises a venturi within said flow passage.

14. Apparatus according to any of the preceding claims, wherein said sensor means includes an optical sensor for detecting at least one of the colour and turbidity of the liquid in use in said flow passage.

15. Apparatus according to any of the preceding claims including means for storing data sensed by at least one of said sensing means.

16. Apparatus according to any of the preceding claims wherein said control means are programmable.

5 17. Apparatus according to any of the preceding claims, including data transfer means for transferring data or instructions between at least one of

(i) said sensor means and

(ii) said control means and

(iii) an external device.

10 18. Apparatus according to Claim 17, wherein said data transfer means is a removable data storage device.

19. Apparatus according to Claim 18, wherein said removable data storage device is a smart card, sim card or the like.

20. Apparatus according to Claim 17, wherein said data transfer means is an  
15 interface device for communicating across a public communications network.

21. Apparatus according to Claim 17, wherein said data transfer means is an infra red input output device.

22. Apparatus according to any of the preceding claims, including means for exposing fluid in said chamber region to an active agent.

20 23. Apparatus according to Claim 22, wherein said active agent is a pH modifier.

24. Apparatus according to Claim 22, wherein said active agent is an anti-microbial agent.

25. Apparatus according to Claim 22, wherein said active agent is a cleansing agent.
26. Apparatus according to Claim 22, wherein said means for exposing comprises a pellet or block of said active agent.
- 5 27. Apparatus according to Claim 26, including means for accelerating dispersion of said active agent.
28. Apparatus according to Claim 27, wherein said acceleration means comprise an electric heater element.
29. Apparatus according to Claim 23 when depending on Claim 9 or any 10 claim dependent thereon, wherein said control means is responsive in use to the output of the pH sensor to control in use the local pH within the flow path.
30. Apparatus according to Claim 6 or any claim dependent thereon, characterised in that the disposable tube and/or the reusable part of the apparatus is provided with means for attaching it to the catheter and a drainage 15 bag.
31. Apparatus according to Claim 6 or any claim dependent thereon, further characterised in that the disposable tube and the reusable part of the apparatus is provided with an automatic means of disconnection from the drainage bag if the drainage bag/tube is accidentally pulled.
- 20 32. Apparatus according to Claim 31 further characterised in that the automatic means of disconnection is by means of a link adapted to be broken when subjected to a predetermined longitudinal force.

33. Apparatus according to claim 6 or any claim dependent thereon characterised in that the disposable tube and valve means are adapted to fit into the reusable electronic unit.

5 34. Apparatus according to Claim 33 further characterised in being provided with a manual override to control the flow of urine from the bladder.

10 35. Apparatus according to any claim 5 or any claim dependent thereon further characterised in that at least one of said first and second flow control means is actuated by said control means to regulate the flow of urine from the bladder when the sensing means detects there is a predetermined pressure of urine in the bladder.

36. Apparatus according to any of the preceding claims further characterised in that the sensing means comprises a pressure switch.

37. Apparatus according to Claim 5 or any claim dependent thereon, further including means for back flushing of the catheter.

15 38. Apparatus according to Claim 37 further characterised in that the means for back flushing of the catheter is via a sealable port on the disposable tube section of the apparatus.

20 39. Apparatus according to Claim 37 further characterised in that the means for back flushing of the catheter is by the provision of means for generating a short term reverse flow of liquid in the form of a pulse within the catheter.

40. Apparatus according to Claim 39 when dependent on Claim 4 or any claim dependent thereon, further characterised in that the means for providing back flushing pulses is by rapid repeated actuation and release of one of said actuators.

41. Apparatus according to any one of the preceding claims further characterised in that a sterilising light source is provided.

42. Apparatus according to Claim 41 further characterised in that the sterilising light source produces ultraviolet light.

5 43. Apparatus according to Claim 41 or Claim 42, further characterised in that the sterilising light source is dispensed within the catheter by means of a "leaky" type of optical fibre.

44. Apparatus according to Claim 43 further characterised in that the optical fibre is loosely inserted in the lumen of the catheter.

10 45. A disposable tube for use in the apparatus of Claim 6, said tube having an inlet end and an outlet end , and resiliently deformable sidewalls by which flow of liquid therethrough may be controlled via sidewall pressure thereon, characterised in that the tube is adapted to be received within said housing.

15 46. A tube according to Claim 45 further characterised in that it includes location means enabling it to be correctly oriented within the housing.

47. A tube according to claim 46 further characterised in that the location means comprises a flange having a flattened region adapted to rest against a correspondingly flattened region of the housing.

20 48. A tube according to any one of claims 45 to 47 further characterised in that it includes an integral pH transducer and associated electrical contacts by which the pH of liquid passing therethrough may be monitored.

49. A tube according to any one of claims 45 to 48 further characterised in that it includes a weakened region in the form of a breakable link adapted to

snap when subjected to a predetermined longitudinal force, relative to the major axis of the tube.

50. A slow release pellet adapted to be inserted within a tube according to any one of claims 45 to 49, the pellet comprising or including a sterilising and/or 5 cleansing agent.

51. A pellet according to Claim 50, further characterised in that it is in the form of a hollow ring dimensioned to fit within the tube and to allow liquid to flow therethrough.

52. A method of controlling the flow of fluid along a catheter, which comprises 10 sensing at least one parameter of fluid in a test section of the flow passage and adjusting the flow therealong in response to said sensed parameter or parameters.

53. A method according to Claim 52, which includes detecting the pH at 15 intervals and applying the measurements of pH to an algorithm which provides an indication of the service life of the catheter.

54. Apparatus substantially as hereinbefore described with reference to Figure 3 and 5.

55. A tube substantially as hereinbefore described with reference to Figures 1 or 4.